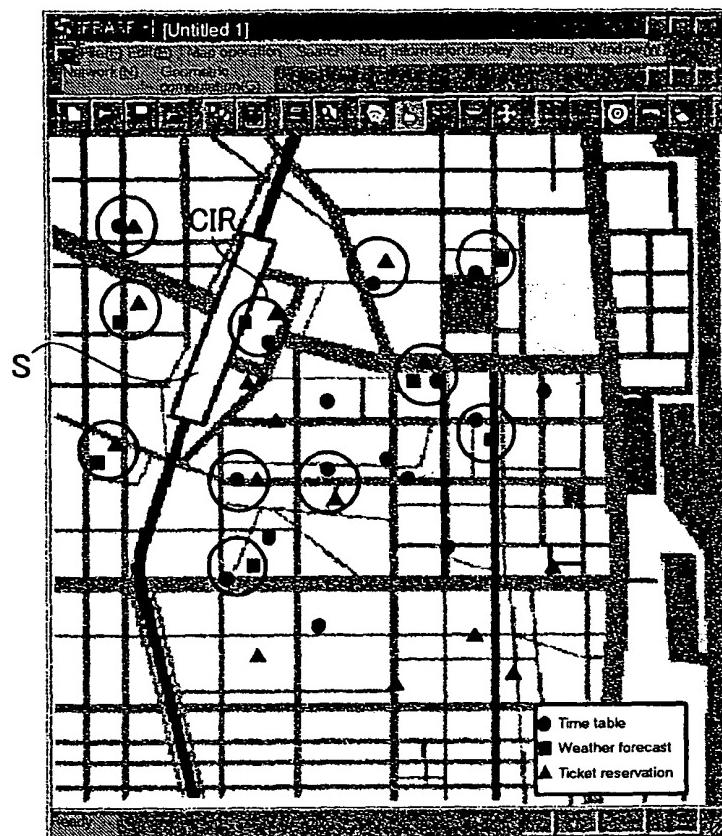


[Document type] Drawing

[Figure 1]

(1/27)



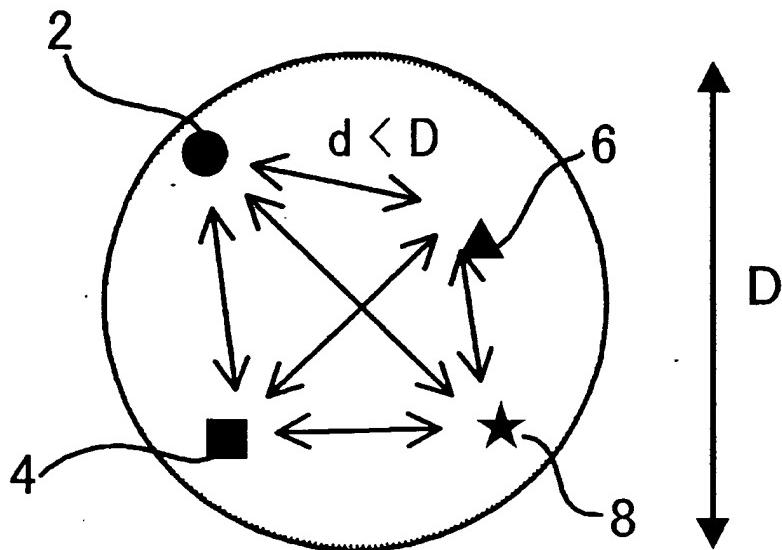
(2/27)

[Figure 2]

Record number	Transaction ID	Position	Service name	Number of transmitted packets	...
1	ab12ef	(x <sub>1</sub> ,y <sub>1</sub> )	Weather forecast	2	...
2	gh34lm	(x <sub>2</sub> ,y <sub>2</sub> )	Time table	1	...
3	no56rs	(x <sub>3</sub> ,y <sub>3</sub> )	Ticket reservation	4	...
4	tu78xy	(x <sub>4</sub> ,y <sub>4</sub> )	Time table	1	...

[Figure 3]

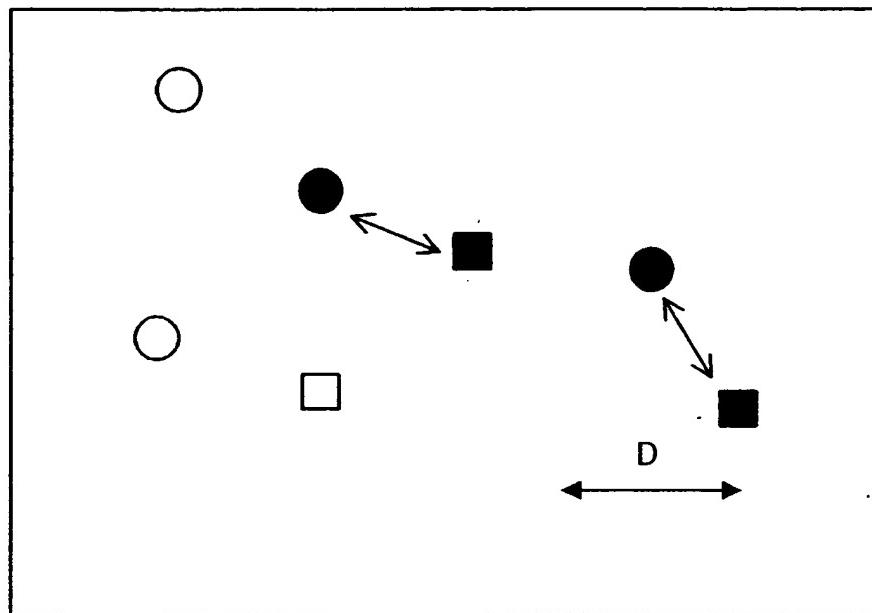
(3/27)



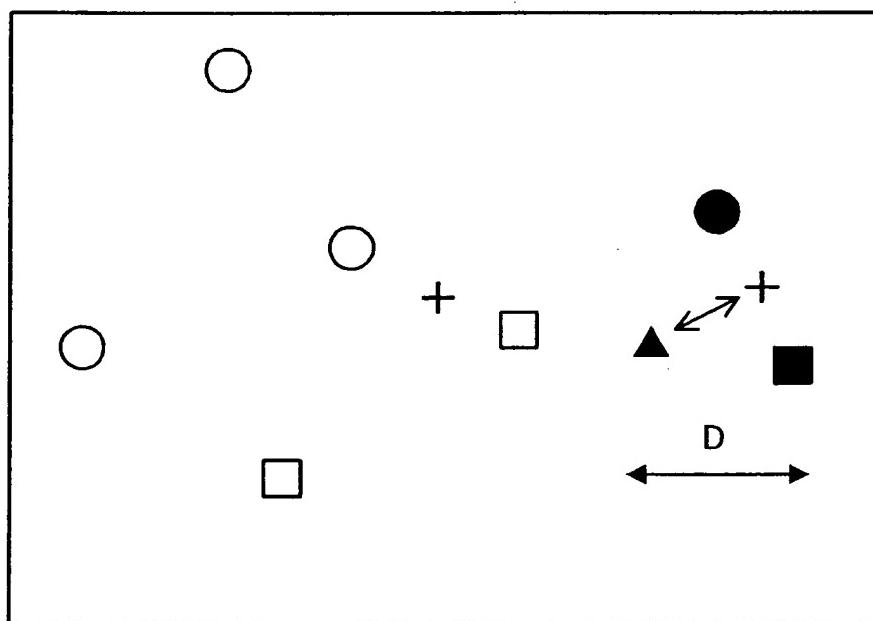
({●, ▲, ■, ★}, n) ...       $n > N$

[Figure 4]

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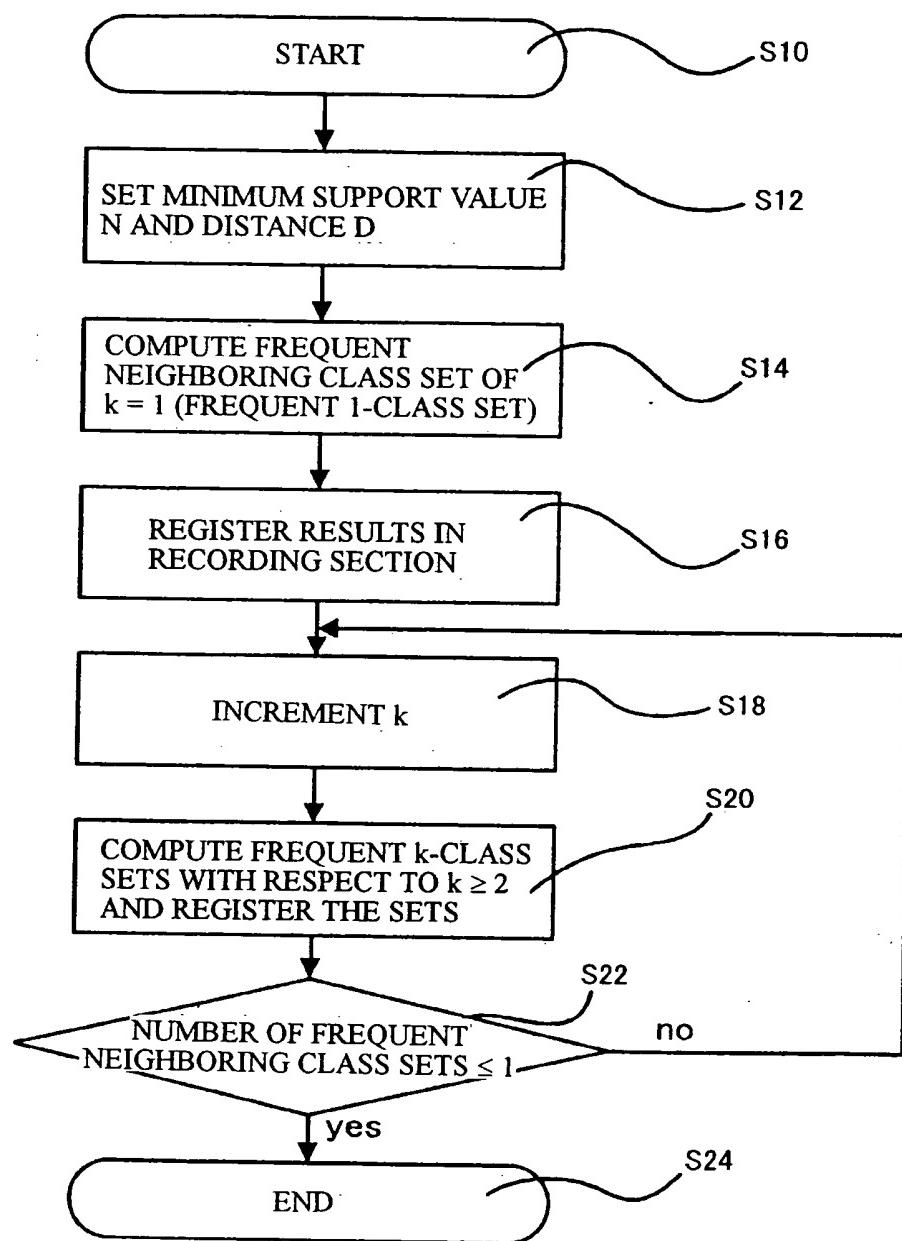
(a)



(b)

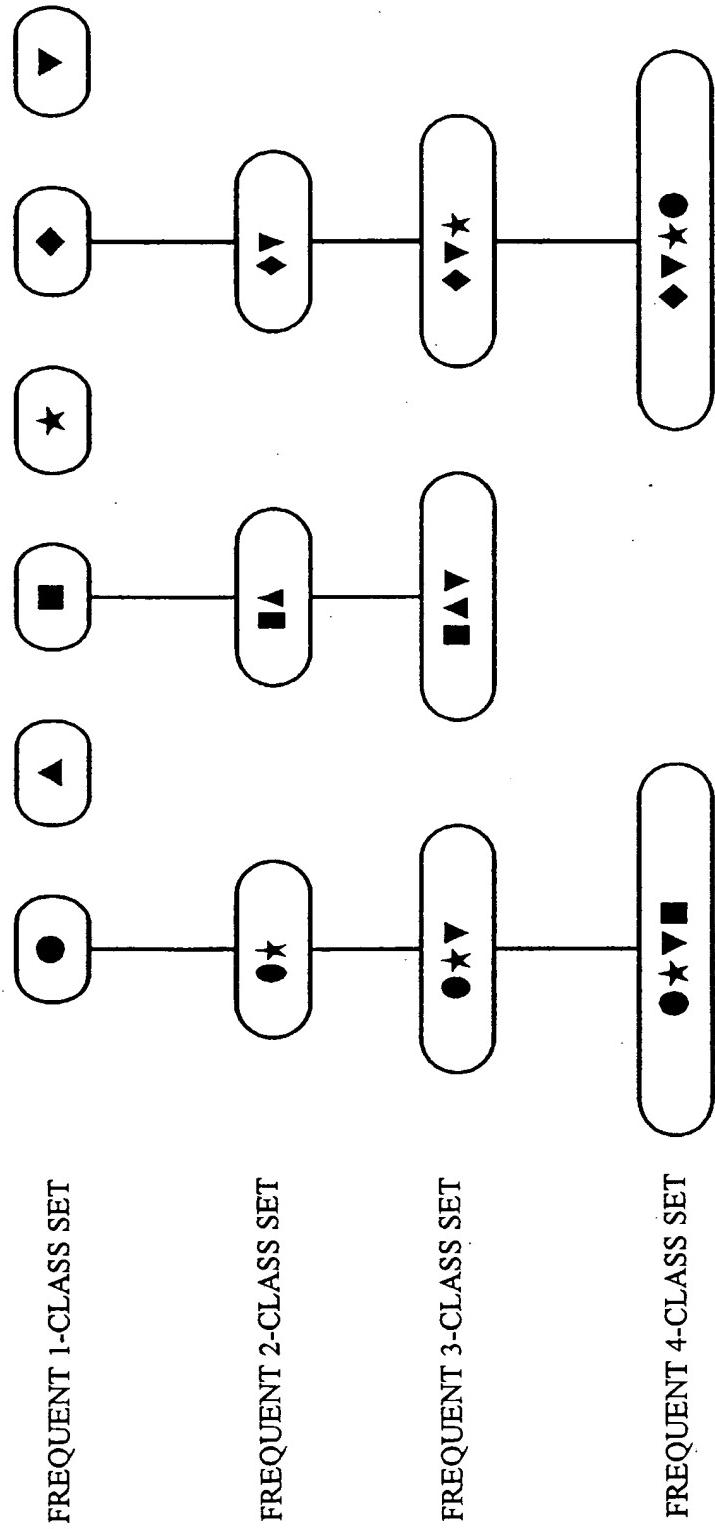
[Figure 5]

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[Figure 6]

(6/27)



[Figure 7]

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For (i=1; i≤m; i++)

/ Compute centroids of instances in proximity to frequent k-class set  $C_k[i] \in S_k$

Obtain set  $G_i$  of centroids of instances /

/ Form voronoi diagram of  $G_i$  /

For j=i+1; i≤m; j++

/ Set  $C_{k+1}[i] \in S_k$  as another neighboring k-class set /

/ Set  $C_{k+1}[i,j]$  as neighboring class set formed of sum-set  $C_k[i] \cup C_k[j]$  of two frequent neighboring class sets /

If total k number of class sets formed from  $|C_{k+1}[i,j]| = k+1$  and  $C_{k+1}[i,j]$  are frequent

$$\text{sup}(C_{k+1}[i,j]) = 0$$

Mark all instances of  $C_{k+1}[i,j]$  as invalid

Set closest distance from all instances of  $C_{k+1}[i,j]$  to  $C_k[j]$  instance as  $\infty$

For (with respect to each instance of  $C_k[j]$ )

Set  $p_j$  to point of  $p_j \in C_k[j]$  and  $p_i \in C_{k+1}[i,j]$

Search for nearest centroid  $g_{\text{nearest}} \in G_i$  from  $p_j$

Set found instance with respect to centroid as  $I_{\text{nearest}}$

Check if  $p_j \in I_{\text{nearest}}$  ( $i=1, \dots, k$ ) is  $\text{dist}(p_j, p_i) < D$

/ If all points of  $I_{\text{nearest}}$  satisfy the above inequality?

If  $I_{\text{nearest}}$  is marked "Invalid"

Mark "Neighboring to  $p_j$ "

Increment  $\text{sup}(C_{k+1}[i,j])$  by 1

Set nearest distance to  $C_k[j]$  instance to  $\text{dist}(g_{\text{nearest}}, p_j)$

If  $\text{dist}(g_{\text{nearest}}, p_j)$  is smaller than nearest distance to present  $C_k[j]$  instance

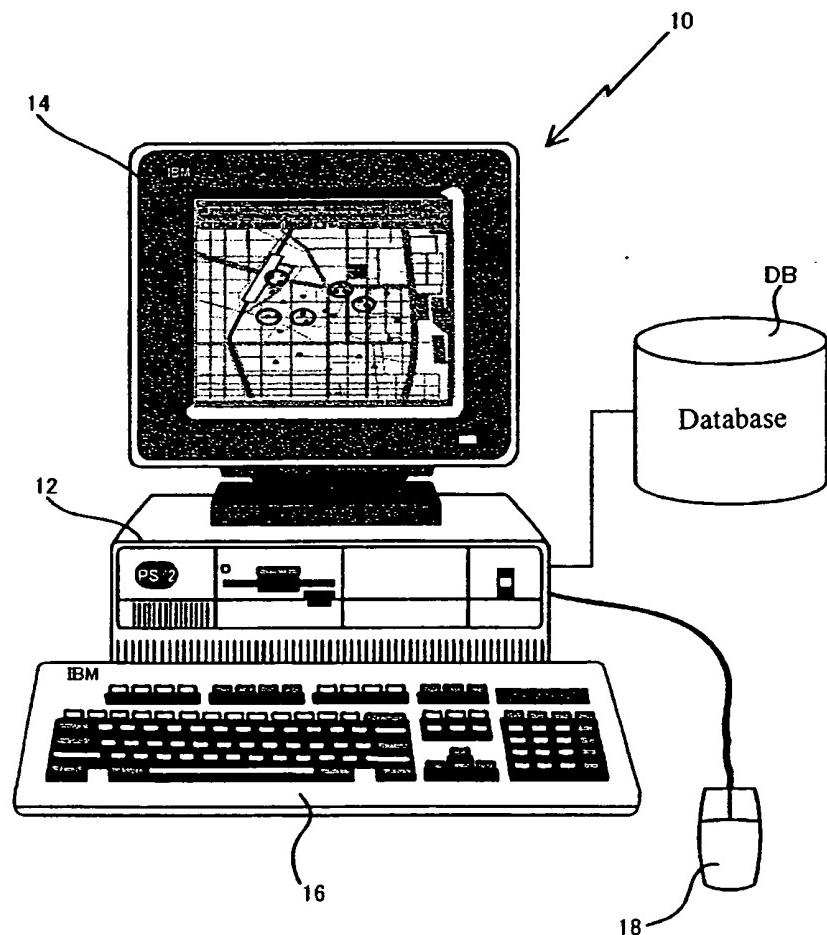
Update nearest distance and mark "Neighboring to  $p_j$ "

If  $\text{sup}(C_{k+1}[i,j]) > N$

Form instance of  $C_{k+1}[i,j]$  from instance of  $C_k[i]$  marked "Neighboring" and add  $C_{k+1}[i,j]$  to  $S_{k+1}$

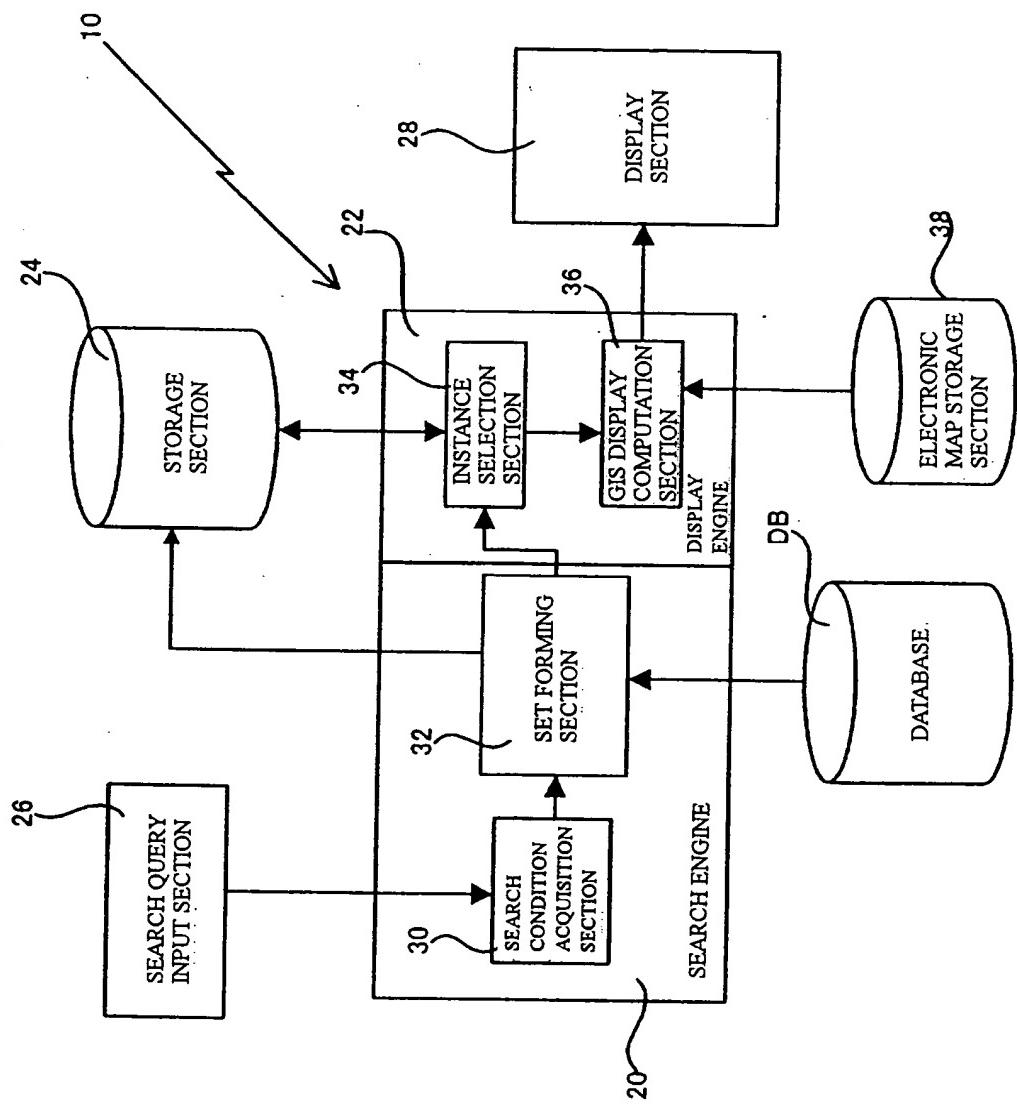
[Figure 8]

(8/27)



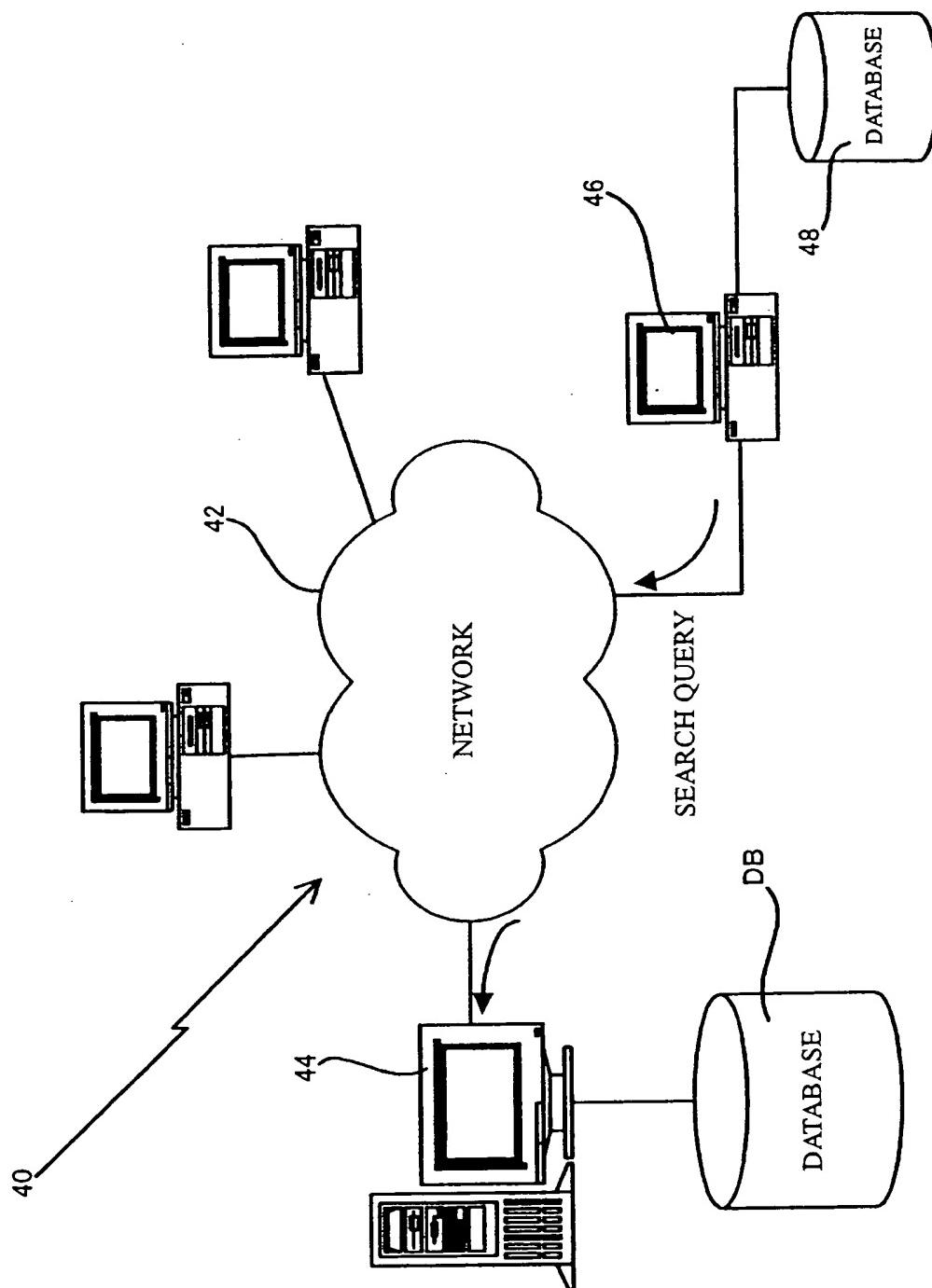
[Figure 9]

(9/27)



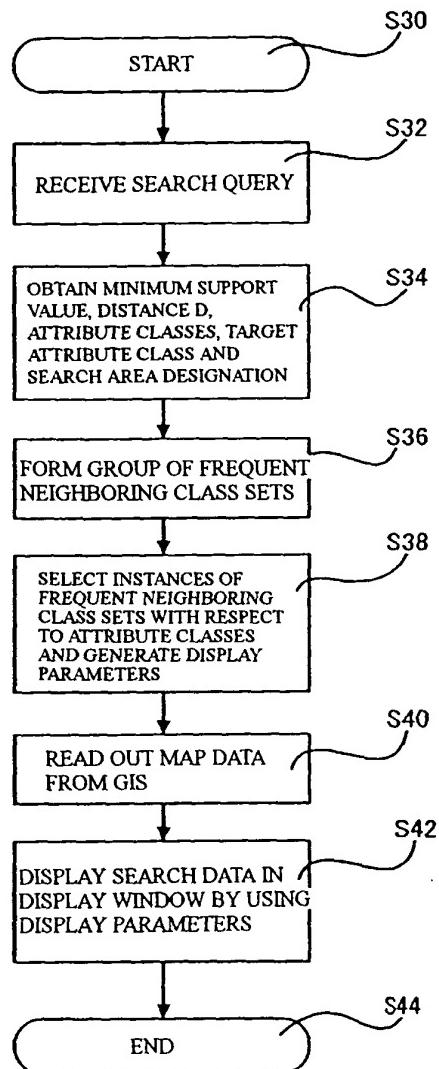
[Figure 10]

(10/27)



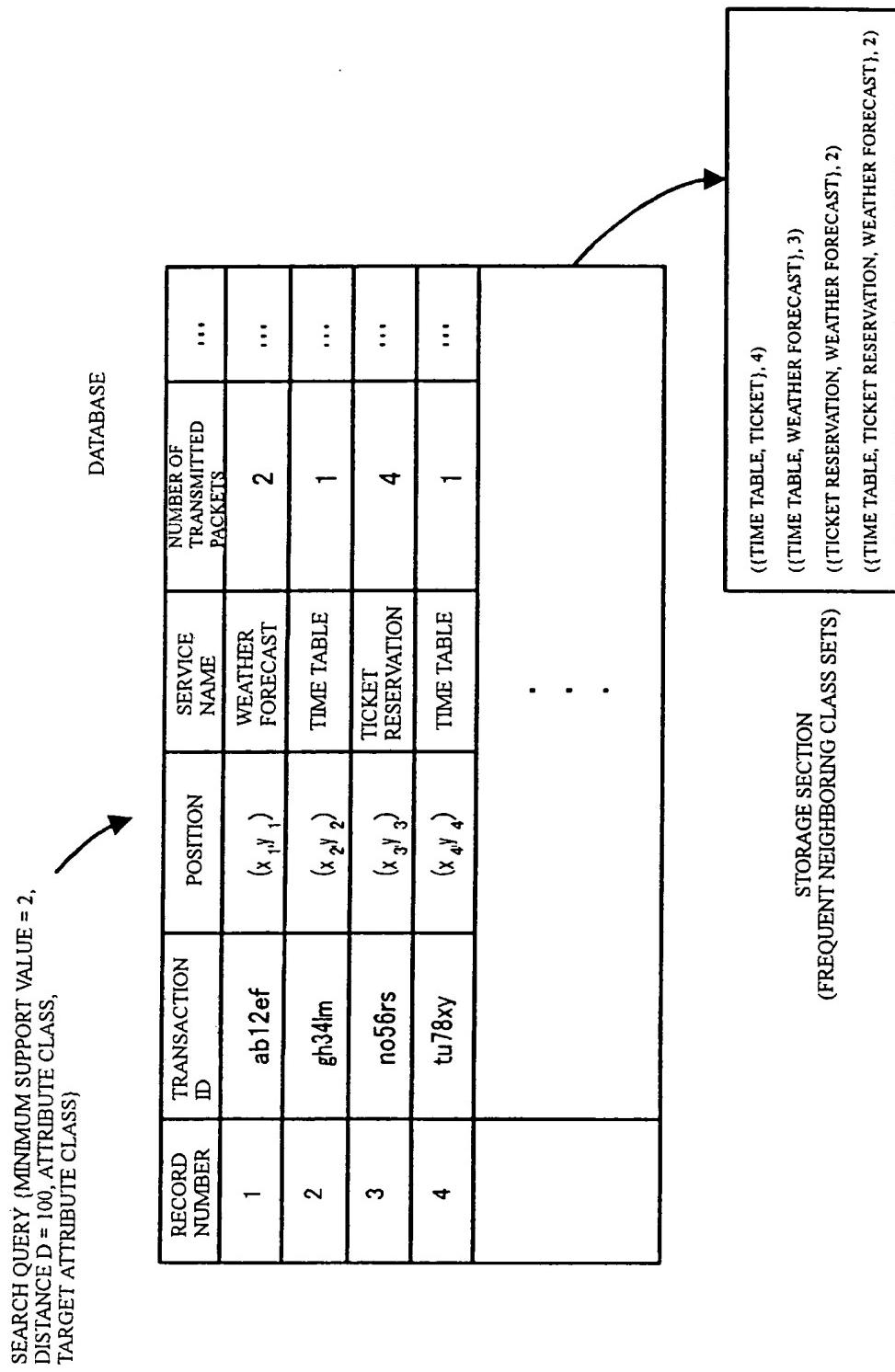
[Figure 11]

(11/27)



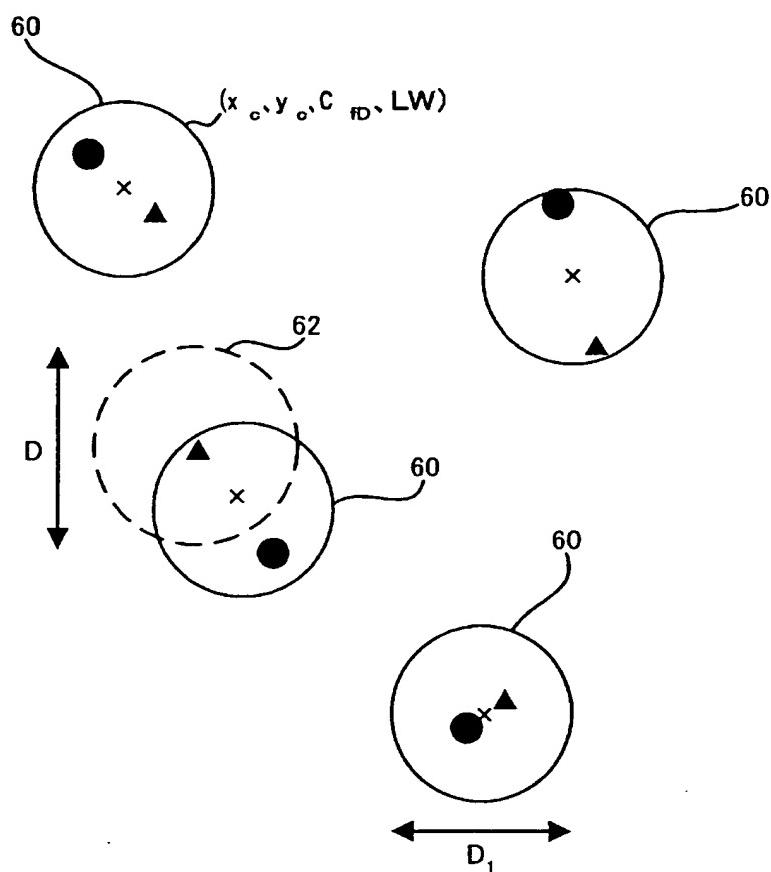
[Figure 12]

(12/27)



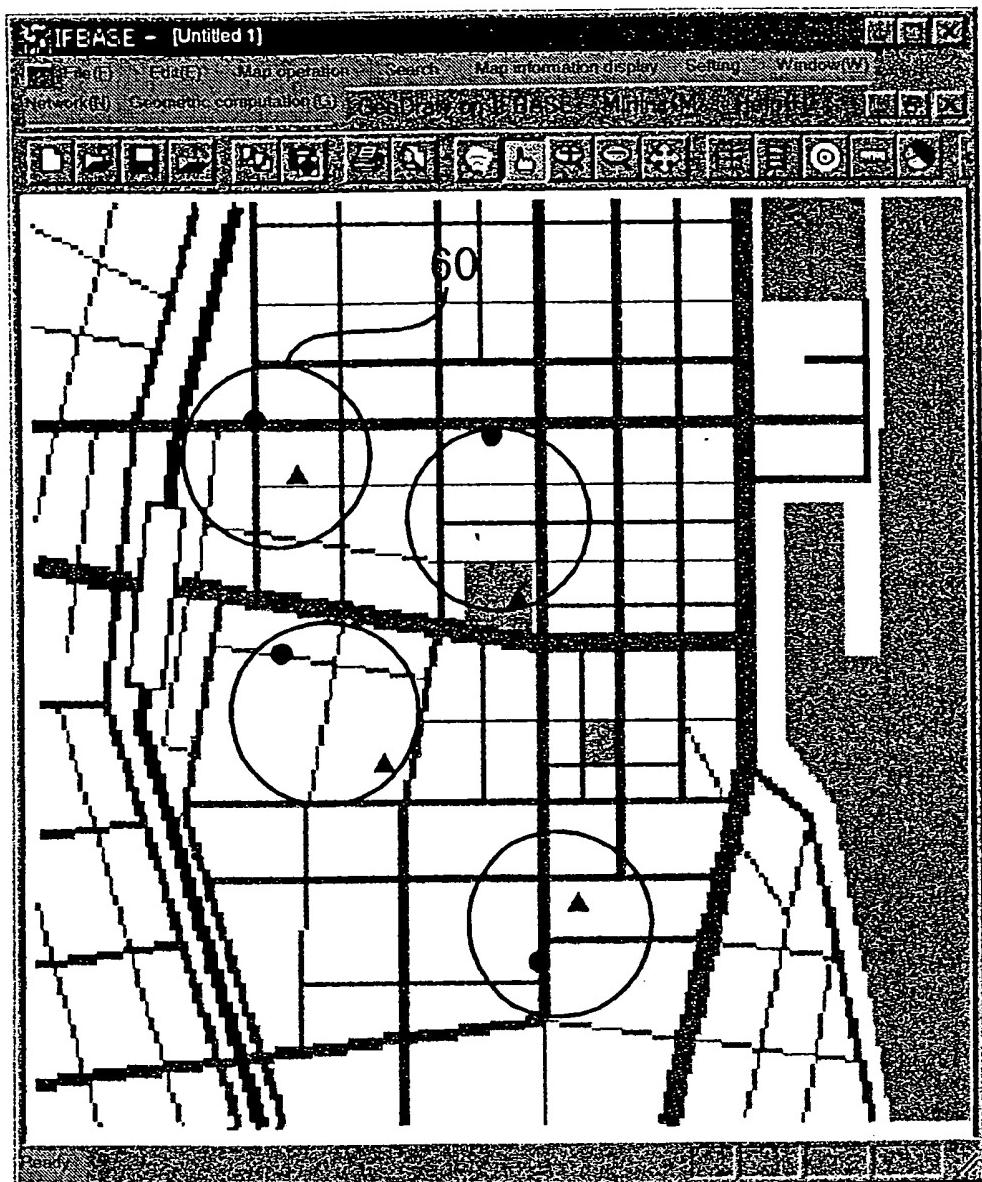
[Figure 13]

(13/27)



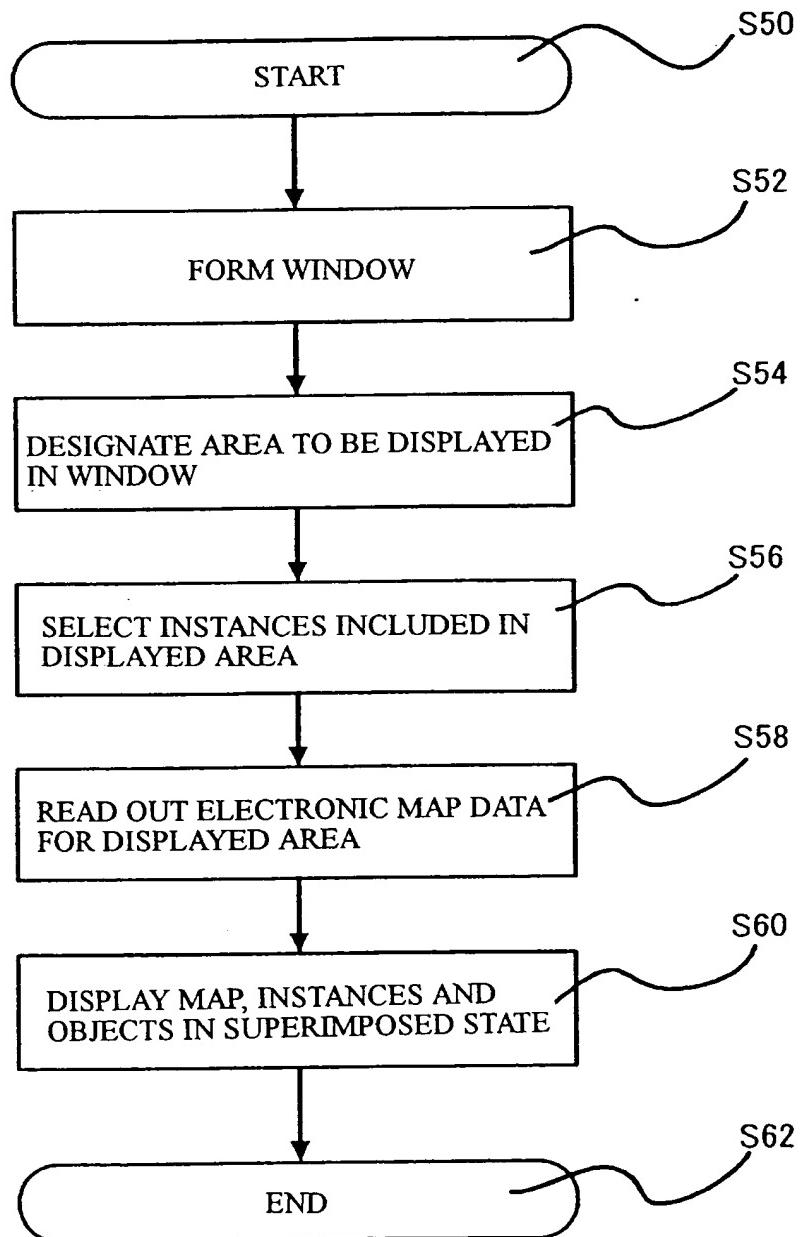
[Figure 14]

(14/27)



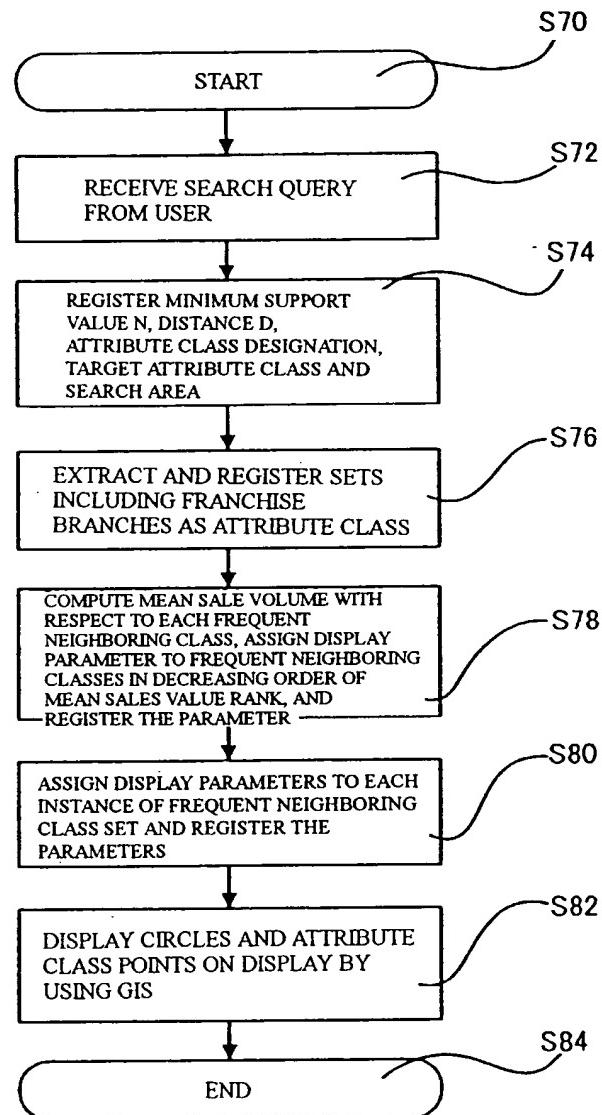
[Figure 15]

(15/27)



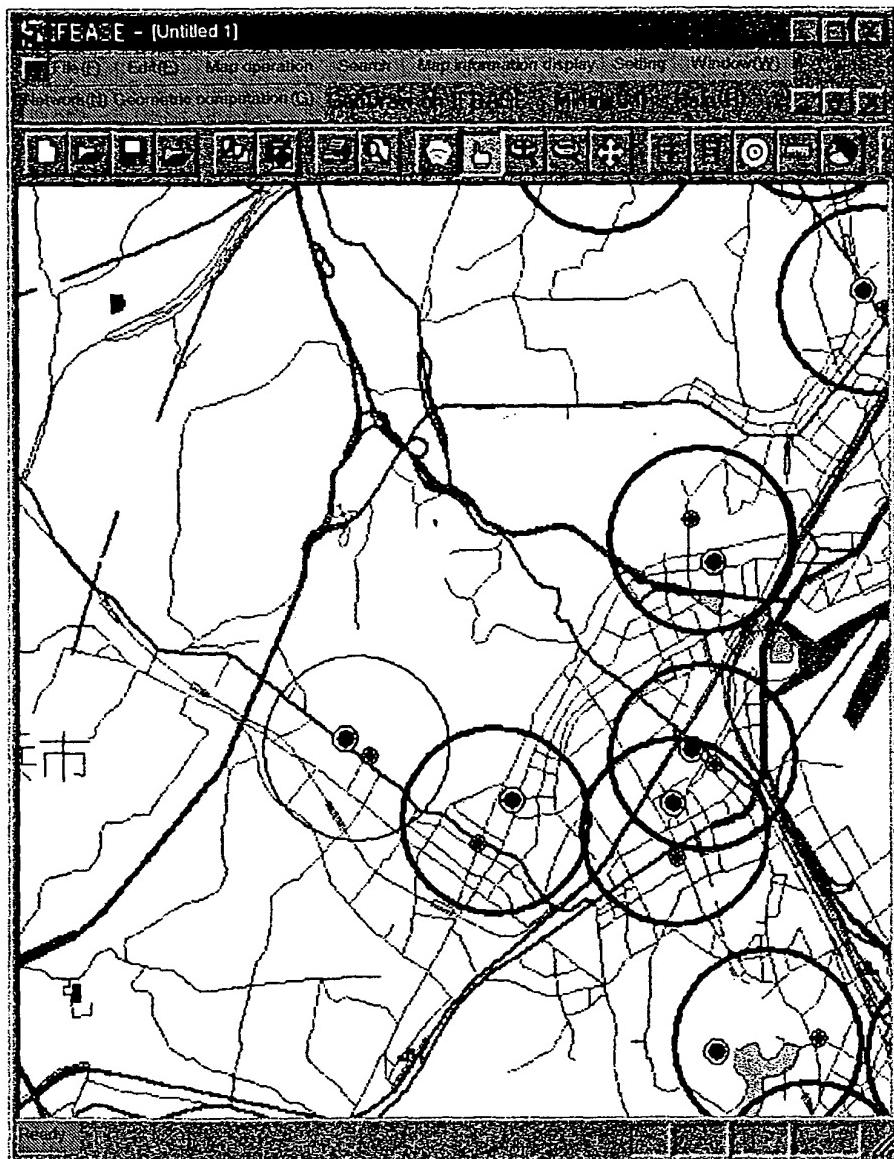
[Figure 16]

(16/27)



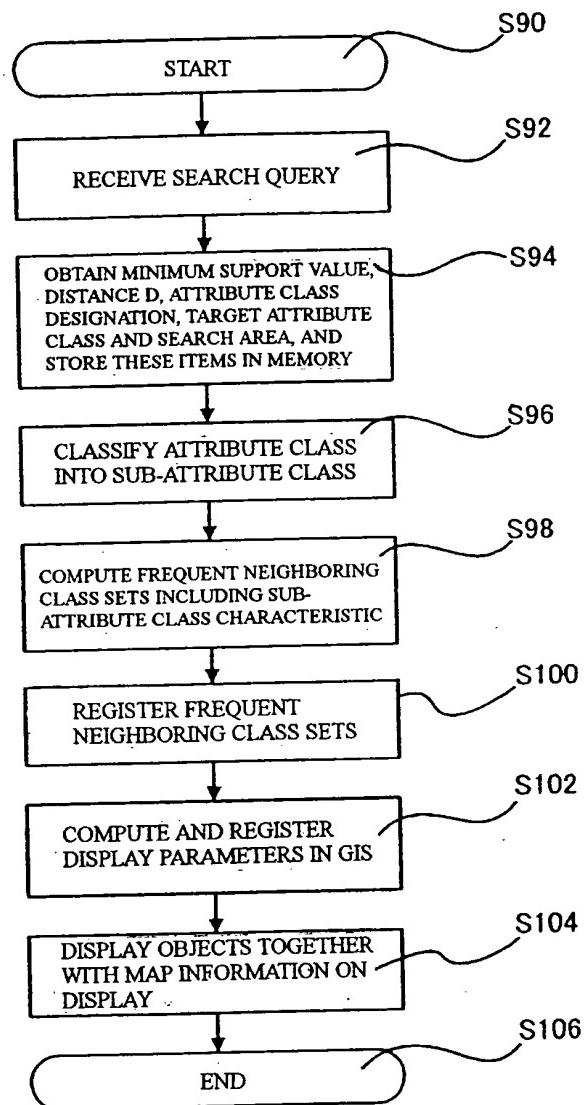
[Figure 17]

(17/27)



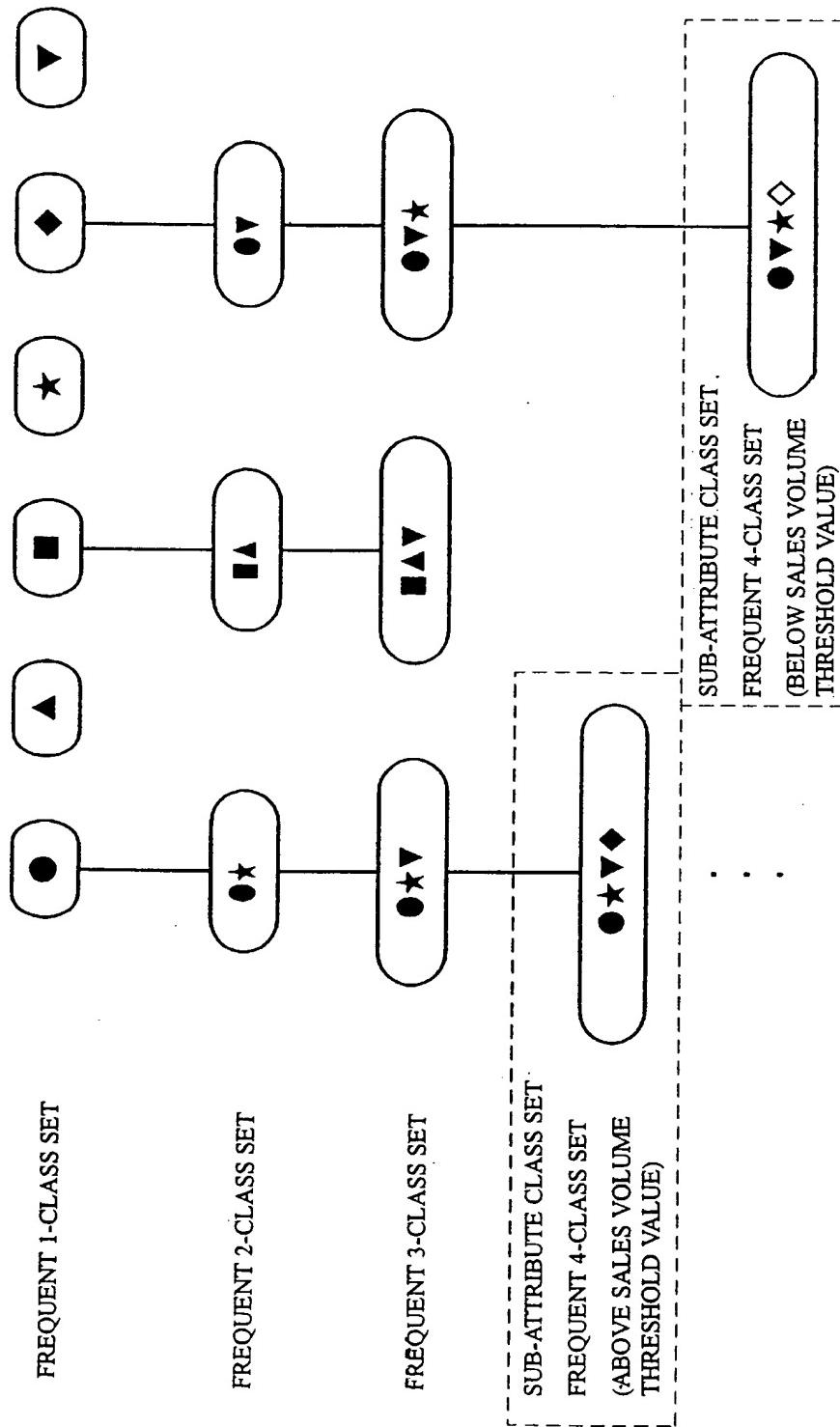
[Figure 18]

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[Figure 19]

(19/27)



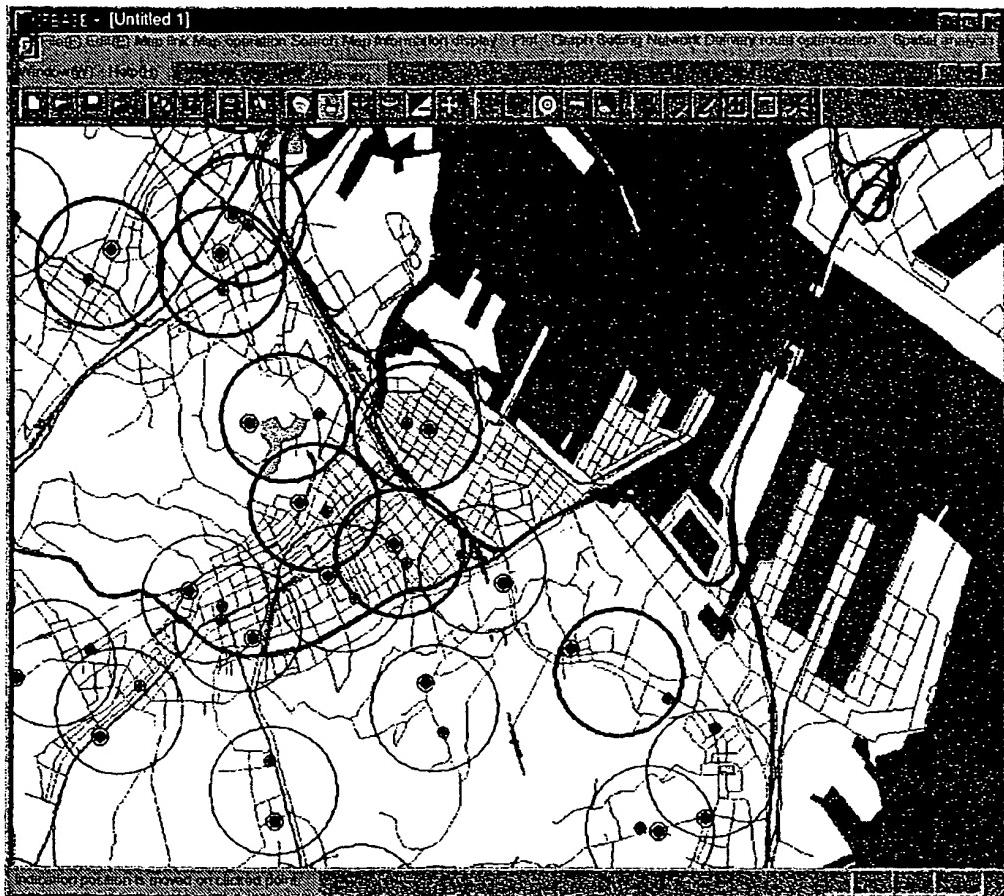
[Figure 20]

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	SUB-ATTRIBUTE CLASS		TOTAL NUMBER OF INSTANCES
	HIGH-SALES BRANCH	LOW-SALES BRANCH	
NUMBER OF INSTANCES OF FREQUENT NEIGHBORING CLASS SETS INCLUDING A	x	y	$x+y$
NUMBER OF INSTANCES OF FREQUENT NEIGHBORING CLASS SETS NOT INCLUDING A	$n_1 - x$	$n_2 - y$	$N - (x+y)$
TOTAL	$n_1$	$n_2$	N

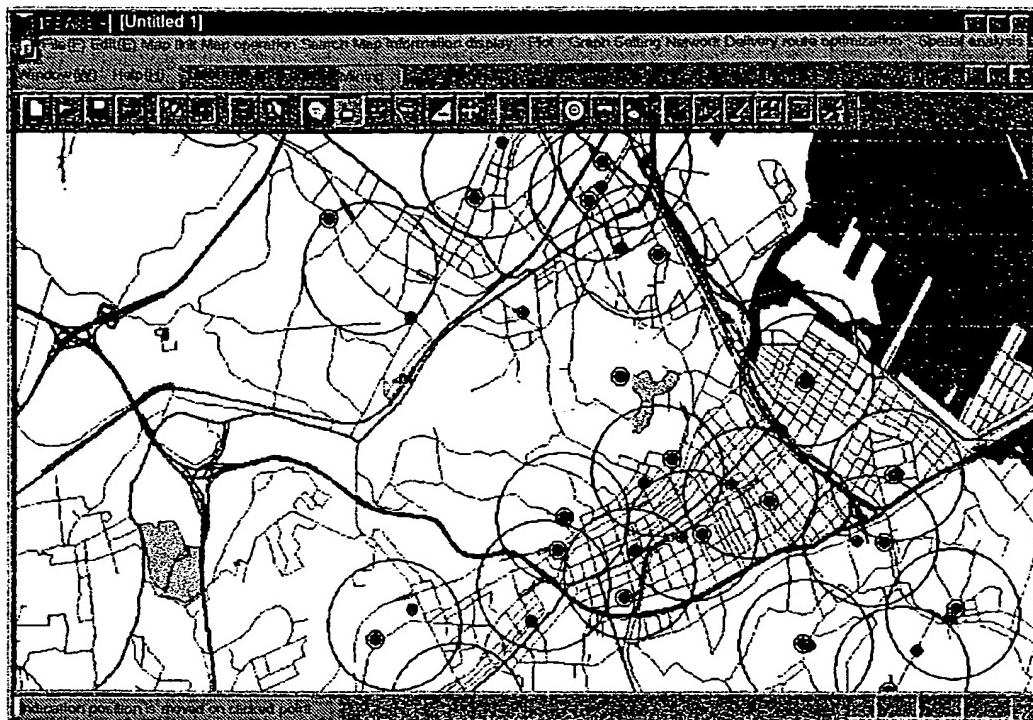
[Figure 21]

(21/27)



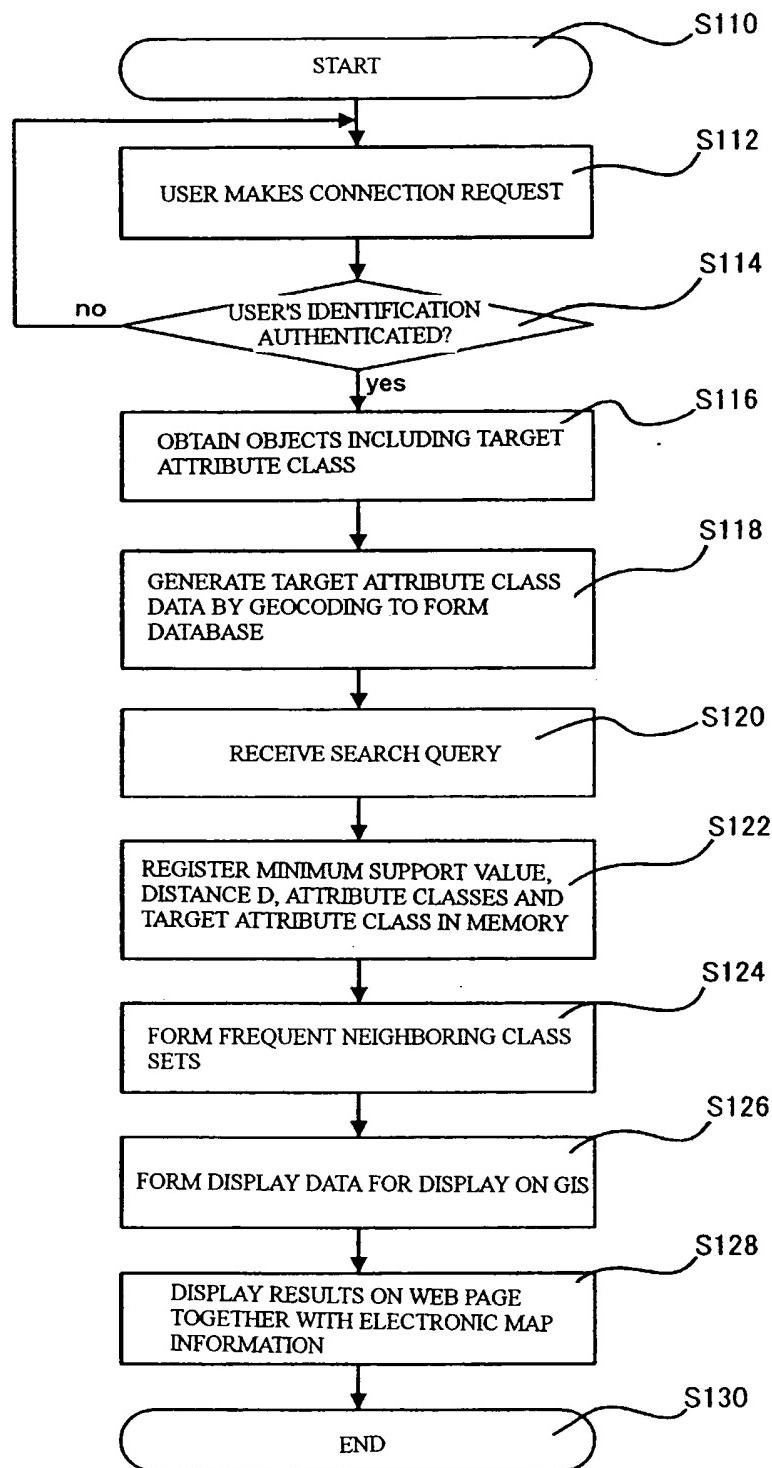
[Figure 22]

(22/27)



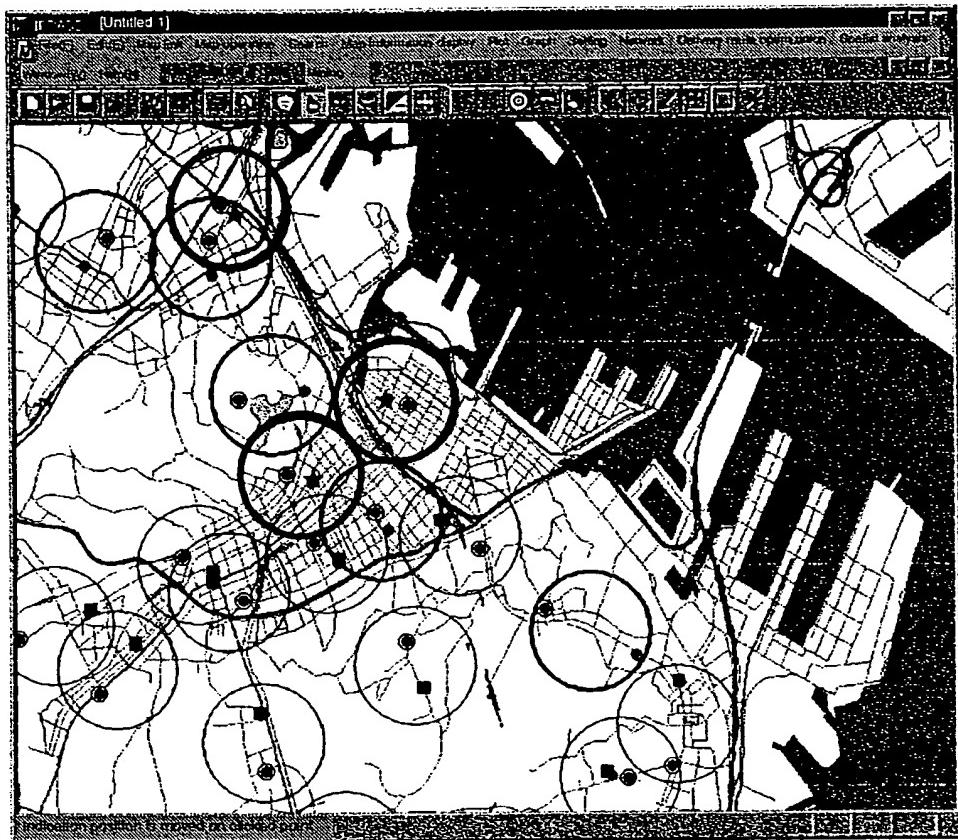
[Figure 23]

(23/27)



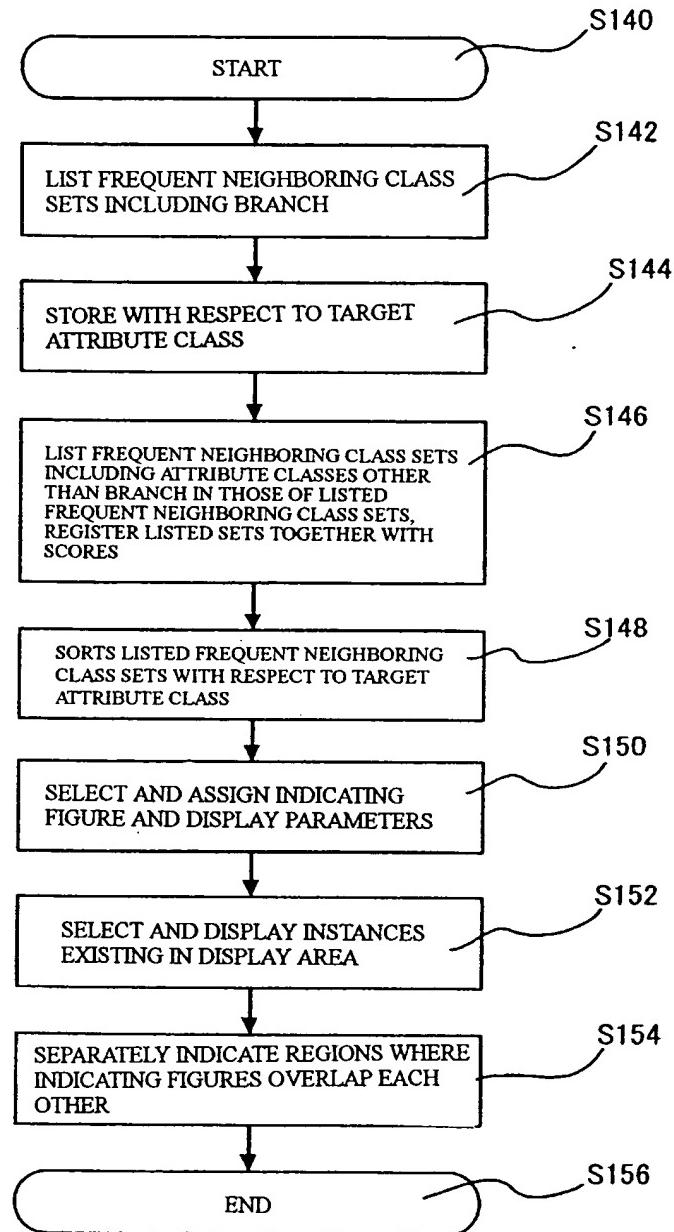
[Figure 24]

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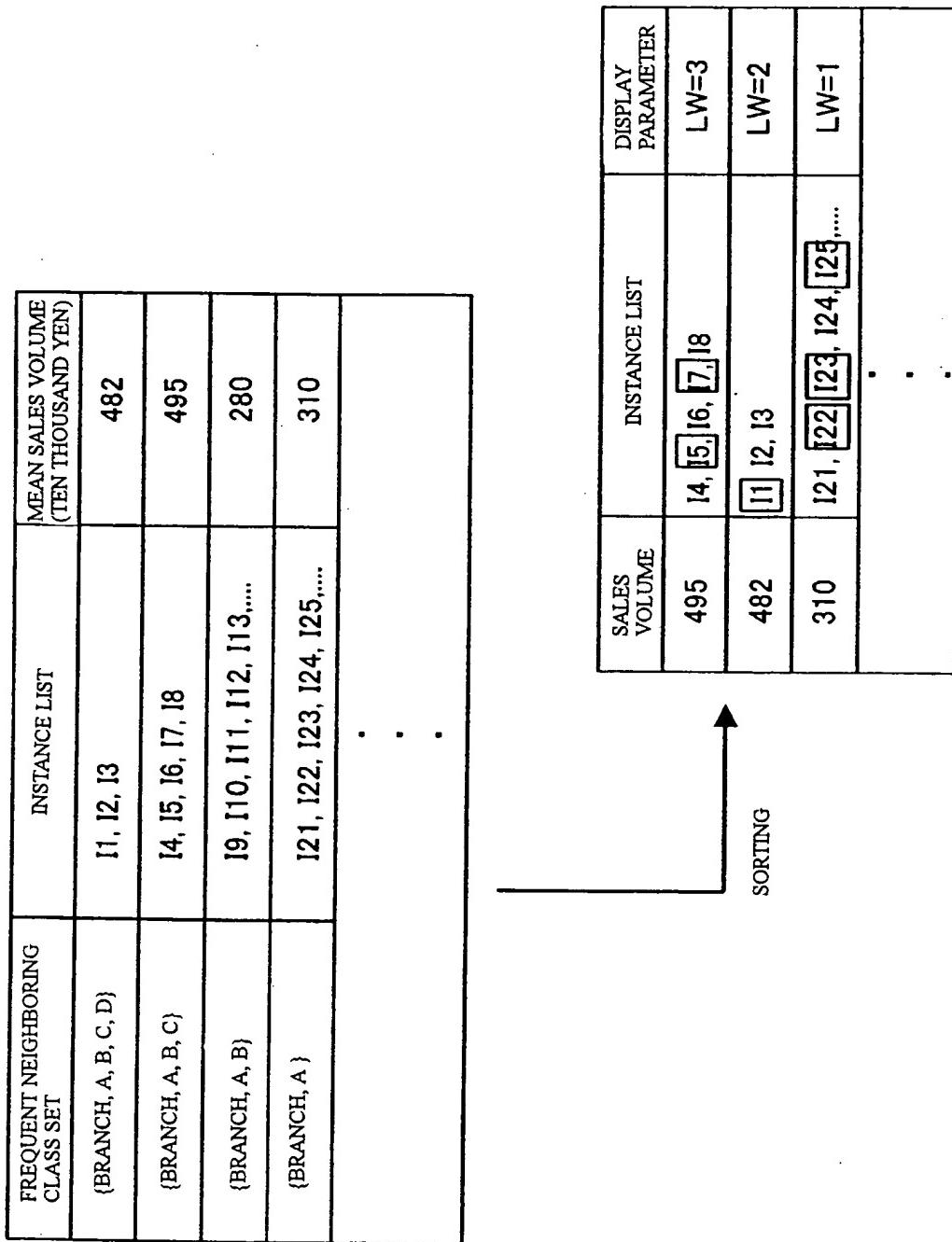
[Figure 25]

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[Figure 26]

(26/27)



[Figure 27]

(27/27)

